

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
New missions enabled by Extra-large launchers (8)

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ARES V DESIGN FOR FLEXIBLE PRODUCTION ENABLING MANY DECADES OF  
SUSTAINABLE EXPLORATION

**Abstract**

The Ares V launch vehicle must perform its human space exploration mission beyond Earth orbit with the Orion crew exploration vehicle and Altair lunar lander, but Ares V also needs the flexibility to support a wide variety of future science missions. Many of the future science missions will be dedicated launches with special payload accommodations and mission operations. Many more will be secondary or piggyback missions coupled to a primary mission. The Ares V production system therefore needs to have the agility to incorporate mission specific payload accommodations and operations plans within the normal production flow. This will add to the economy of the system for all users and will facilitate upgrades for many decades of sustainable space exploration. This paper discusses how mission accommodations and continuous improvement agility can be built into the Ares V production system using modern digital product definition and processing methods coordinated to a fleet health management system. Modern 3D solid modeling and computational based simulation and analysis provide the foundation for a digital thread that flows through all aspects of design, development, qualification, production and operations. This digital thread controls the form and fit of components rather than inflexible coordinated tooling. Mission peculiar or improved components can be substituted as needed without prohibitive retooling costs. A fleet health management system coordinates computational based qualification models with the original qualification test data and data from each Ares V production acceptance procedure and mission performance parameter. This system incrementally adds to the Ares V qualification database with every unit produced and every mission flown. Basic system improvements and mission peculiar features can be qualified by informed models backed up by a manageable set of special analyses and delta qualification tests. By using this approach, rather than simply building in performance margins, Ares V can be optimized for the primary Orion and Altair missions yet have the flexibility to perform currently envisioned and unforeseen future science missions. This makes Ares V efficient for each mission and fresh for many decades of sustained space exploration and science.